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Indian Standard

HOROLOGY — GAUGES FOR WATCH BEZEL AND BACK COVERS — DIMENSIONS AND TOLERANCES

ICS 39.040.10 ; 17.040.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1996 **Price Group 5**

Horology Sectional Committee, LM 23

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Horology Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard provides the dimensions and tolerances of 'GO' and 'NOT GO' snap, plain plug, thread plug and thread ring gauges, to be used for checking the threads of watch bezel and watch back covers. To check the pitch diameter limits and limits of the total profile of new solid screw ring gauges ('GO' and 'NOT GO'), the dimensions and tolerances of screw check plugs ('GO' and 'NOT GO') are covered in this standard. All the gauges are bound to wear after usage. As such, the dimensions and tolerances of wear check plugs ('GO' and 'NOT GO') are also included, to check the wear limits of pitch diameter of the 'GO and 'NOT GO' screw ring gauges.

This standard is one of a series of Indian Standards relating to watch bezel and watch back cover threads. Other standards in this series are:

IS 10363 : 1982	Dimensions for fixing devices for threaded back covers for watch cases
IS 14338 : 1996	Horology — Basic and design profile of screw threads for watch bezel and back covers
IS 14339 : 1996	Horology — Watch bezel and back cover gauges — Technical supply conditions — General

In the formulation of this standard, necessary assistance has been derived from the following International Standards:

NIHS 60-30 : 1965	Boites etanches — Filetages des fonds et des carrures — Lunettes (water resistance cases — Back cover and Bezel Threads), issued by the Normes De L'Industrie Horlogere, Suisse; and
ISO 1502 : 1978	ISO general purpose metric screw threads — Gauging, issued by the International Organization for Standardization

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HOROLOGY — GAUGES FOR WATCH BEZEL AND BACK COVERS — DIMENSIONS AND TOLERANCES

1 SCOPF

This standard prescribes dimensions and tolerances of gauges used for checking threads on watch bezels and watch back covers.

2 REFERENCES

The following Indian Standards contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
5388 : 1983	Haxagonal handles for plain and threaded plug gauges (*second revision*)
14338 : 1996	Basic and design profile of screw threads for watch bezel and back covers
14339 : 1996	Watch bezel and back cover gauges — Technical supply conditions — General

3 SYMBOLS AND EXPLANATION

In the list given below, the symbols used in this standard are explained:

	Symbol	*Explanation*
i)	P	Pitch
ii)	$\frac{T_{\alpha 1}}{2}$	Tolerance for the flank angle of profiles — For 'GO' gauge
iii)	$\frac{T_{\alpha 2}}{2}$	Tolerance for the flank angle of profiles — For 'NOT GO' gauge
iv)	T_{CP}	Tolerance for the pitch diameter of 'GO' and 'NOT GO' screw check plugs and wear check plugs.
v)	Tp	Tolerance for the pitch of the gauge thread

For horological industry the thread pitch (P) is normally 0.5 mm for which corresponding values of $\frac{T_{\alpha 1}}{2}$ and $\frac{T_{\alpha 2}}{2}$ is 25 minutes and for Tp is 0.005 mm.

4 MATERIAL

The material for the gauges shall be as prescribed in IS 14339 : 1996.

5 GENERAL FEATURES OF SCREW GAUGES

All gauges shall be designed to conform to the Taylor principle as far as possible. This applies not only to the gauges for checking workpiece threads but also to the gauges intended for checking or setting those gauges. Exceptions are only permissible where there is justification for them.

NOTE — The Taylor principle is a statement to the effect that the maximum material limits of as many related elements or dimensions as practical should be incorporated in the 'GO' gauge; whereas the minimum material limit of each such related element or dimension may be gauged only by individual minimum material limit gauges or gauging methods.

5.1 Function, Checking and Use of Gauges

5.1.1 *'GO' Screw Gauge*

5.1.1.1 The 'GO' screw gauge checks the virtual size of the thread on the 'GO' side (gauging the virtual pitch diameter). This is effected by checking the limit (maximum by Ring and minimum by Plug) of the pitch diameter, taking into account pitch errors, errors in the flank angles, helix variations and deviations of form (departures from roundness and lack of straightness of the thread axis over the gauge length) which produce an apparent reduction in internal and enlargement in external thread pitch diameter of the workpiece (virtual pitch diameter). In addition it checks whether the length of straight flank is sufficient, that is the rounding at the root of the profile does not encroach too far upon the flank of the thread. 'GO' plug gauge also checks the minimum limit of the major diameter.

5.1.1.2 It is recommended that the 'GO' screw gauge be checked regularly for wear.

5.1.1.3 The 'GO' screw gauge screwed by hand, without using excessive force, shall pass over the whole length of the workpiece thread. If this is not possible, the workpiece thread does not comply with the specifications.

5.1.2 *'NOT GO' Screw Gauge*

5.1.2.1 The 'NOT GO' screw gauge checks whether the actual pitch diameter exceeds the specified size. The 'NOT GO' screw plug gauge checks approximately on the Taylor principle. The 'NOT GO' screw ring gauge does not correspond to the Taylor principle when checking the rigid workpieces.

5.1.2.2 It is recommended that the 'NOT GO' screw gauge be checked regularly for wear.

5.1.2.3 The 'NOT GO' screw gauge screwed by hand, without using excessive force, may enter into both ends of the threaded part, but not more than two turns of thread. If it can be screwed in more than two turns of thread, the workpiece thread does not comply with the specifications. The 'NOT GO' screw gauge shall not pass completely through a workpiece with a length of thread of three threads or less.

5.2 Workpiece Thread Design

The basic design of the threads on watch bezel and back cover, shall be as recommended in IS 14338 : 1996.

5.3 General Requirements

5.3.1 The gauges shall meet the technical supply conditions as given in IS 14339:1996.

5.3.2 The length of thread on the 'GO' screw gauge shall be at least 80 percent of the length of engagement of the workpiece thread.

5.3.3 The length of thread on the 'NOT GO' screw gauge shall be atleast three turns of thread .

6 'GO' AND 'NOT GO' SNAP GAUGES

6.1 Snap gauges as shown in Fig.1 shall be used for measuring the major diameter of threads in back covers as per IS 14338 : 1996.

6.2 The 'GO'/'NOT GO' dimensions of snap gauges are given in Table 1 to be read with Fig. 1.

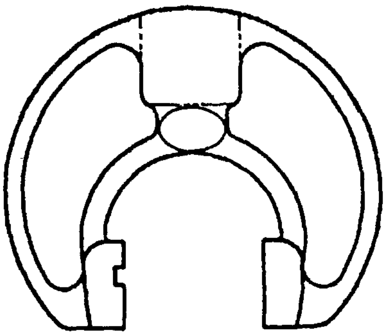


FIG. 1 PLAIN 'GO'/'NOT GO' SNAP GAUGE

Table 1 Dimensions for 'GO'/'NOT GO' Snap Gauges
(*Clause* 6.2)

All dimensions in millimetres.

Dimensions		GO Size Wear Limit	Used for Measuring Major Dia of Threads of NOM Size
GO Tol ± 0.004	NOT GO Tol ±0.004		
19.992	19.938	20.000	M20 × 0.5
20.992	20.938	21.000	M21 × 0.5
21.992	21.938	22.000	M22 × 0.5
22.992	22.938	23.000	M23 × 0.5
27.492	27.438	27.500	(M27.5 × 0.5)[1)]
27.992	27.938	28.000	M28 × 0.5
28.992	28.938	29.000	M29 × 0.5
29.992	29.938	30.000	M30 × 0.5

[1)] Non preferred size. Not to be used for new designs.

7 PLAIN PLUG GAUGES

Plain plug gauges as shown in Fig. 2 shall be used for measuring the minor diameter of threads in watch bezels as per IS 14338 : 1996. The dimensions of 'GO'/'NOT GO' plugs are given in Table 2 to be read with Fig. 2.

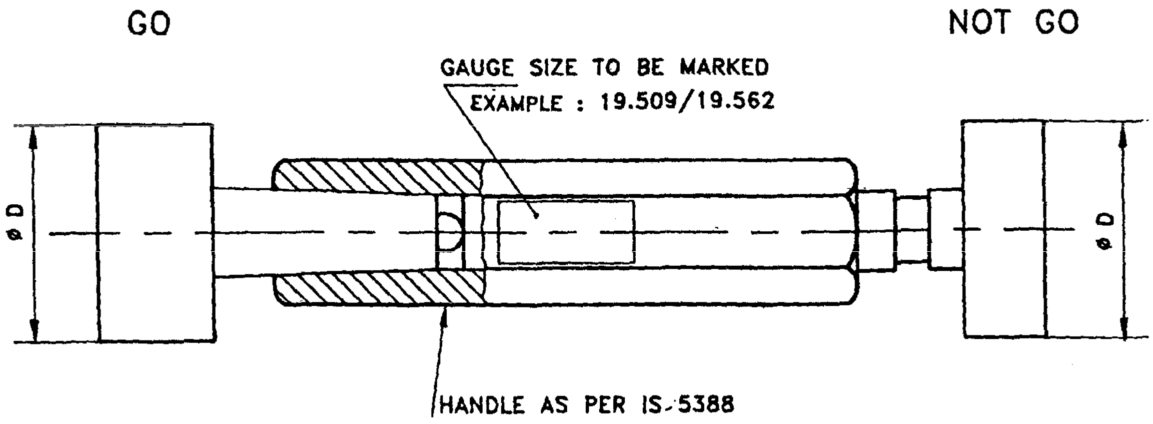


FIG. 2 PLAIN PLUG GAUGE

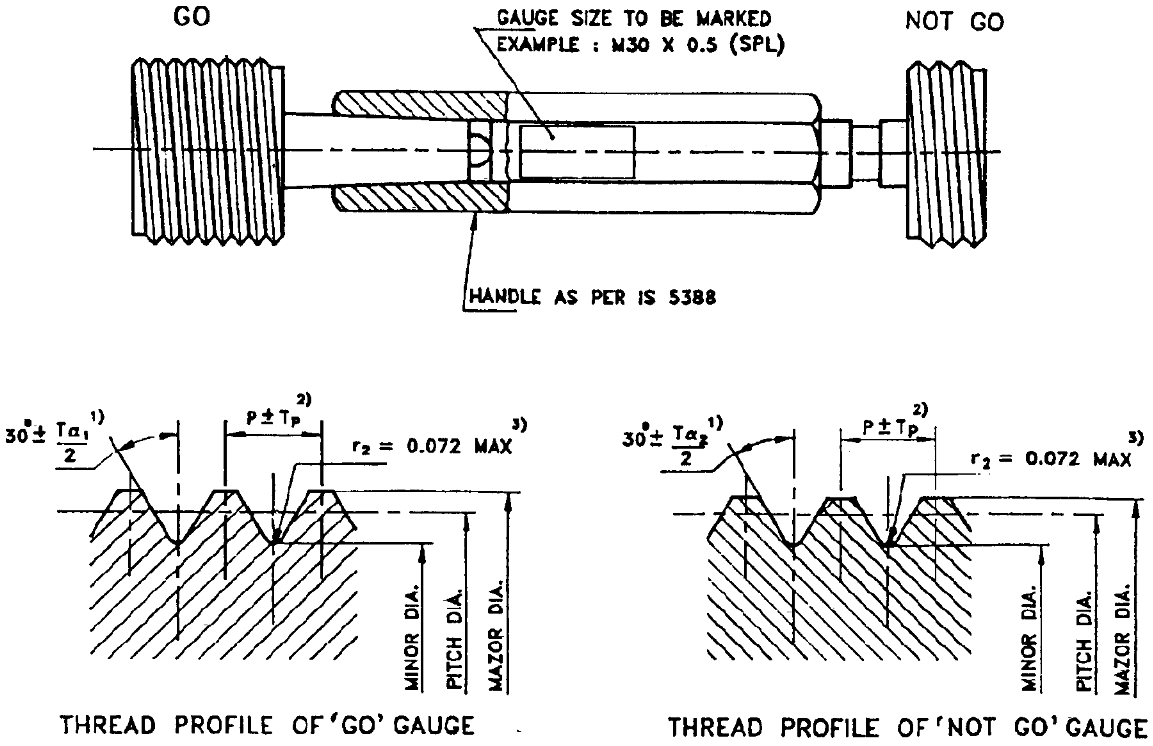
Table 2 Dimensions for 'GO'/'NOT GO' Plain Plug Gauges
(*Clause* 7)
All dimensions in millimetres.

Dimensions		GO Size Wear Limit	Used for Measuring Minor Dia of Threads of NOM Size
GO Tol = ±0.004	NOT GO Tol = ±0.004		
19.509	19.562	19.438	M20 × 0.5
20.509	20.562	20.438	M21 × 0.5
21.509	21.562	21.438	M22 × 0.5
22.509	22.562	22.438	M23 × 0.5
27.009	27.062	26.938	(M27.5 × 0.5)[1]
27.509	27.562	27.438	M28 × 0.5
28.509	28.562	28.438	M29 × 0.5
29.509	29.562	29.438	M30 × 0.5

[1] Non preferred size. Not to be used for new designs.

8 SCREW PLUG GAUGES

Screw plug gauge as shown in Fig. 3 shall be used for measuring threads of watch bezel. The dimensions for major, minor and pitch diameters for 'GO' and 'NOT GO' screw plug gauges are given in Table 3 to be read with Fig. 3.



THREAD PROFILE OF 'GO' GAUGE

THREAD PROFILE OF 'NOT GO' GAUGE

[1] Tol for flank angle $\frac{T\alpha1}{2} = \frac{T\alpha2}{2}$. = 25 minutes .

[2] Pitch tolerance Tp = 0.005 mm.

[3] Alternatively a suitable clearance groove may be provided.

All dimensions in millimetres.

FIG. 3 SCREW PLUG GAUGE FOR WATCH BEZEL

Table 3 Dimensions for Major, Minor and Pitch Diameter of Screw Plug Gauges

(*Clause* 8)

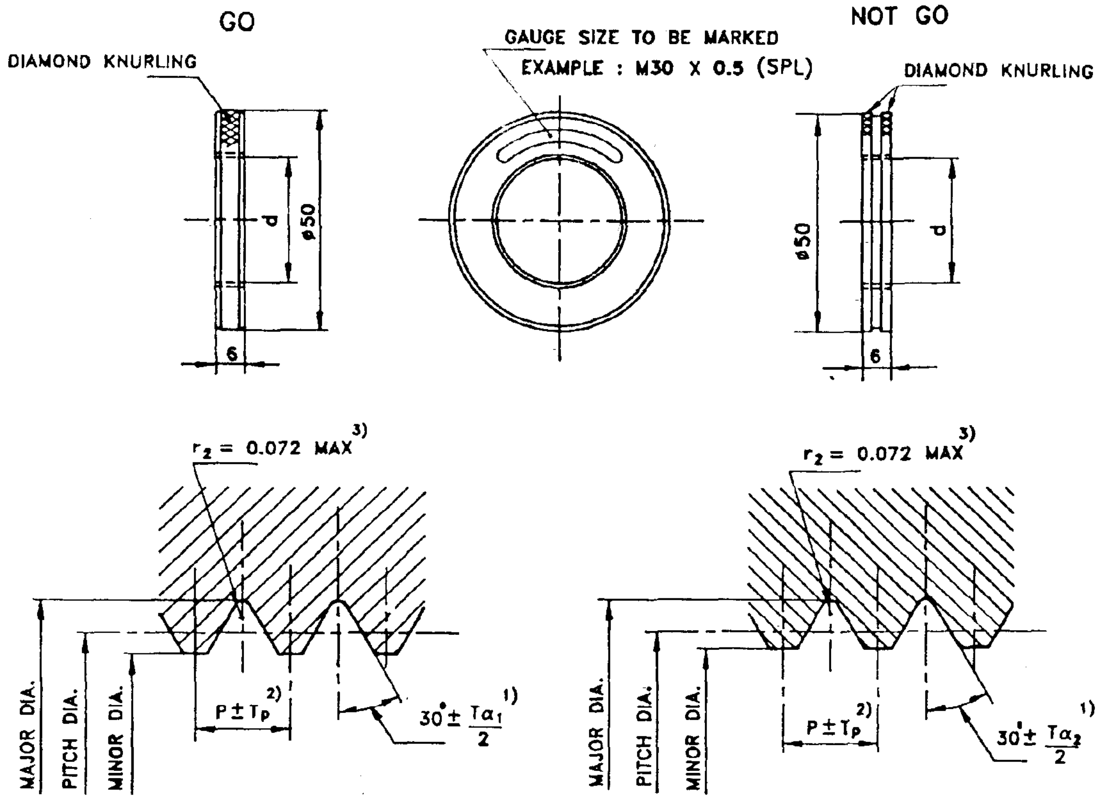
All dimensions in millimetres.

Nominal Size and Pitch	Gauge Type	Major Dia Size Tol = ± 0.007	Minor Dia *Max*	Pitch Dia Size Tol = ± 0.0035	Pitch Dia Wear Limit
M20×0.5	GO	20.002	19.428	19.752	19.743
	NOT GO	19.934	19.428	19.834	19.826
M21×0.5	GO	21.002	20.428	20.752	20.743
	NOT GO	20.934	20.428	20.834	20.826
M22×0.5	GO	22.002	21.428	21.752	21.743
	NOT GO	21.934	21.428	21.834	21.826
M23×0.5	GO	23.002	22.428	22.752	22.743
	NOT GO	22.934	22.428	22.834	22.826
(M27.5×0.5)[1]	GO	27.502	26.928	27.252	27.243
	NOT GO	27.434	26.928	27.334	27.326
M28×0.5	GO	28.002	27.428	27.752	27.743
	NOT GO	27.934	27.428	27.834	27.826
M29×0.5	GO	29.002	28.428	28.752	28.743
	NOT GO	28.934	28.428	28.834	28.826
M30×0.5	GO	30.002	29.428	29.752	29.743
	NOT GO	29.934	29.428	29.834	29.826

[1] Non preferred size. Not to be used for new designs.

9 SCREW RING GAUGES

Screw ring gauge as shown in Fig. 4 shall be used for measuring threads of watch back covers. The dimensions for major, minor and pitch diameters for 'GO' and 'NOT GO' screw ring gauges are given in Table 4 to be read with Fig. 4.



THREAD PROFILE OF 'GO' GAUGE

THREAD PROFILE OF 'NOT GO' GAUGE

[1] Tol for flank angle $\frac{T\alpha 1}{2} = \frac{T\alpha 2}{2} = 25$ minutes.

[2] Pitch tolerance $Tp = 0.005$ mm.

[3] Alternatively a suitable clearance groove may be provided.

All dimensions in millimetres.

FIG. 4 SCREW RING GAUGE FOR BACK COVERS

Table 4 Dimensions for Major, Minor and Pitch Diameters of Screw Ring Gauges

(*Clause* 9)

All dimensions in millimetres.

Nominal Size and Pitch	Gauge Type	Major Dia *Min*	Minor Dia Size	Minor Dia Tol	Pitch Dia Size Tol $Tcp = \pm 0.005$
M20×0.5	GO	20.043	19.480	± 0.005	19.728
	NOT GO	20.002	19.565	± 0.010	19.665
M21×0.5	GO	21.043	20.480	± 0.005	20.728
	NOT GO	21.002	20.565	± 0.010	20.665
M22×0.5	GO	22.043	21.480	± 0.005	21.728
	NOT GO	22.002	21.565	± 0.010	21.665
M23×0.5	GO	23.043	22.480	± 0.005	22.728
	NOT GO	23.002	22.565	± 0.010	22.665
(M27.5×0.5)[1]	GO	27.543	26.900	± 0.005	27.228
	NOT GO	27.502	27.065	± 0.010	27.165
M28×0.5	GO	28.043	27.480	± 0.005	27.728
	NOT GO	28.002	27.565	± 0.010	27.665
M29×0.5	GO	29.043	28.480	± 0.005	28.728
	NOT GO	29.002	28.565	± 0.010	28.665
M30×0.5	GO	30.043	29.480	± 0.005	29.728
	NOT GO	30.002	29.565	± 0.010	29.665

[1] Non preferred size. Not to be used for new designs.

10 SCREW CHECK PLUGS FOR NEW SOLID 'GO' SCREW RING GAUGE

10.0 These screw check plug ('GO' and 'NOT GO') are used to check the limits of the pitch diameter of the new solid 'GO' screw ring gauge. The 'GO' screw check plug checks the 'GO' limit of the total profile of the appropriate new solid 'GO' screw ring gauge.

10.1 The 'GO' screw check plug screwed by hand, without using excessive force, shall pass through the new solid 'GO' screw ring gauge.

10.2 The 'NOT GO' screw check plug screwed by hand, without using excessive force, may enter into both ends of the new solid 'GO' screw ring gauge, but not more than one turn of thread.

10.3 The dimensions for minor, major and pitch diameters of screw check plugs for new 'GO' screw ring gauges are given in Table 5 to be read with Fig. 5.

11 SCREW CHECK PLUGS FOR NEW SOLID 'NOT GO' SCREW RING GAUGES

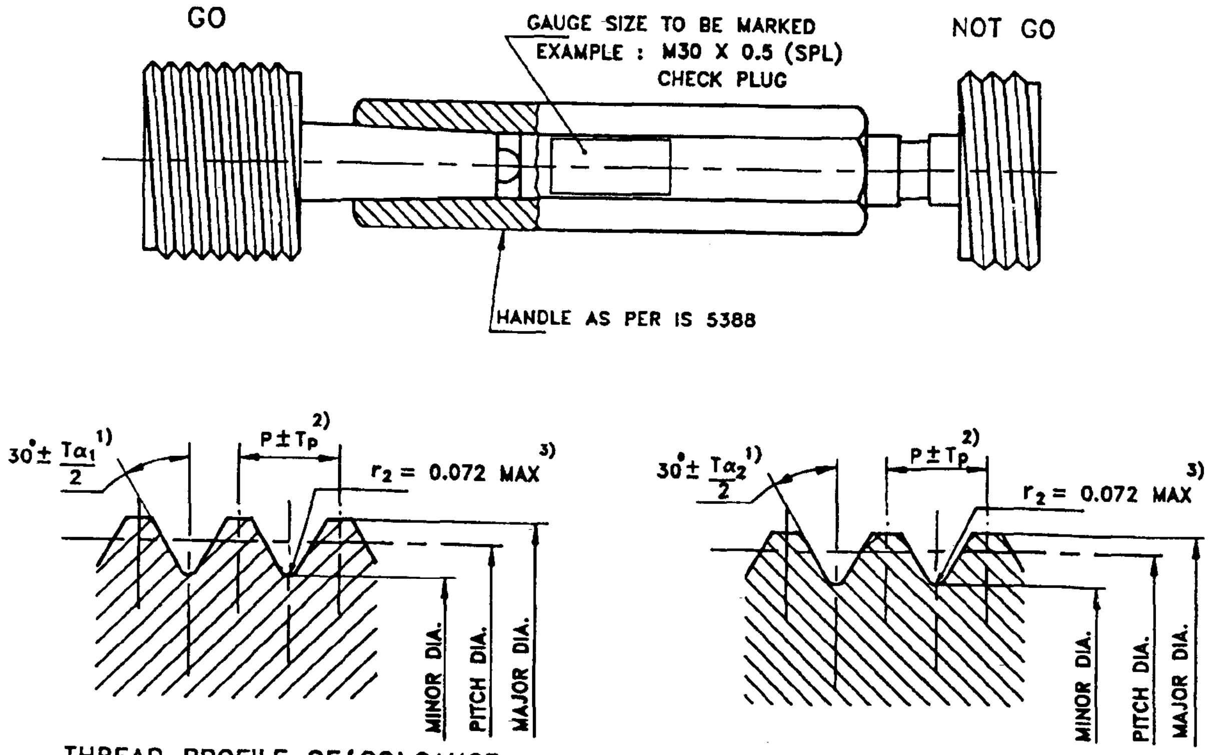
11.0 The check plugs ('GO' and 'NOT GO') are used to check the pitch diameter limits of the new solid 'NOT GO' screw ring gauge. The 'GO' screw check plug makes sure that the clearing diameter of the new 'NOT GO' solid screw ring gauge is not too small.

11.1 If a wear check plug for the 'NOT GO' screw ring gauge is provided, the 'NOT GO' check plug may be dispensed with.

11.2 The 'GO screw check plug screwed by hand, without using excessive force, shall pass through the corresponding new solid 'NOT GO' screw ring gauge.

11.3 The 'NOT GO' check plug gauge screwed by hand, without using excessive force, may enter the new solid 'NOT GO' screw ring gauge at both ends but not more than one turn of thread.

11.4 The dimensions for minor, major and pitch diameters for screw check plugs for new 'NOT GO' screw ring gauges are given in Table 6 to be read with Fig. 6.



THREAD PROFILE OF 'GO' GAUGE

THREAD PROFILE OF 'NOT GO' GAUGE

[1] Tol for flank angle $\frac{T\alpha 1}{2} = \frac{T\alpha 2}{2} = 25$ minutes.

[2] Pitch tolerance $Tp = 0.005$ mm.

[3] Alternatively a suitable clearance groove may be provided.

All dimensions in millimetres.

FIG. 5 SCREW CHECK PLUG GAUGE FOR NEW 'GO' SCREW RING GAUGE

Table 5 Dimensions for Minor, Major and Pitch Diameters of Screw Check Plugs for New 'GO' Screw Ring Gauges

(*Clause* 10.3)

All dimensions in millimetres.

Nominal Size and Pitch	Gauge Type	Major Dia		Minor Dia *Max*	Pitch Dia Size Tol 'T_{CP}' = ±0.003 5
		Size	Tol		
M20×0.5	GO	20.000	± 0.007	19.394	19.716
	NOT GO	19.833	± 0.003 5	19.403	19.733
M21×0.5	GO	21.000	± 0.007	20.394	20.716
	NOT GO	20.833	± 0.003 5	20.403	20.733
M22×0.5	GO	22.000	± 0.007	21.394	21.716
	NOT GO	21.833	± 0.003 5	21.403	21.733
M23×0.5	GO	23.000	± 0.007	22.394	22.716
	NOT GO	22.833	± 0.003 5	22.403	22.733
(M27.5×0.5)[1]	GO	27.500	± 0.007	26.894	27.216
	NOT GO	27.333	± 0.003 5	26.903	27.233
M28×0.5	GO	28.000	± 0.007	27.394	27.716
	NOT GO	27.833	± 0.003 5	27.403	27.733
M29×0.5	GO	29.000	± 0.007	28.394	28.716
	NOT GO	28.833	± 0.003 5	28.403	28.733
M30×0.5	GO	30.000	± 0.007	29.394	29.716
	NOT GO	29.833	± 0.003 5	29.403	29.733

[1] Non preferred size. Not to be used for new designs.

12 WEAR CHECK PLUG GAUGE FOR SOLID 'GO' SCREW RING GAUGE

12.0 The wear check plug gauge is used to ascertain that the pitch diameter of the 'GO' screw ring gauges has not exceeded the wear limit.

12.1 The wear check plug screwed by hand, without using excessive force, may enter into both ends of the 'GO' screw ring gauge, but not more than one turn of thread.

12.2 If it can be screwed in more than one turn of thread, the'GO' screw ring gauge no longer meets the specification and should be scrapped.

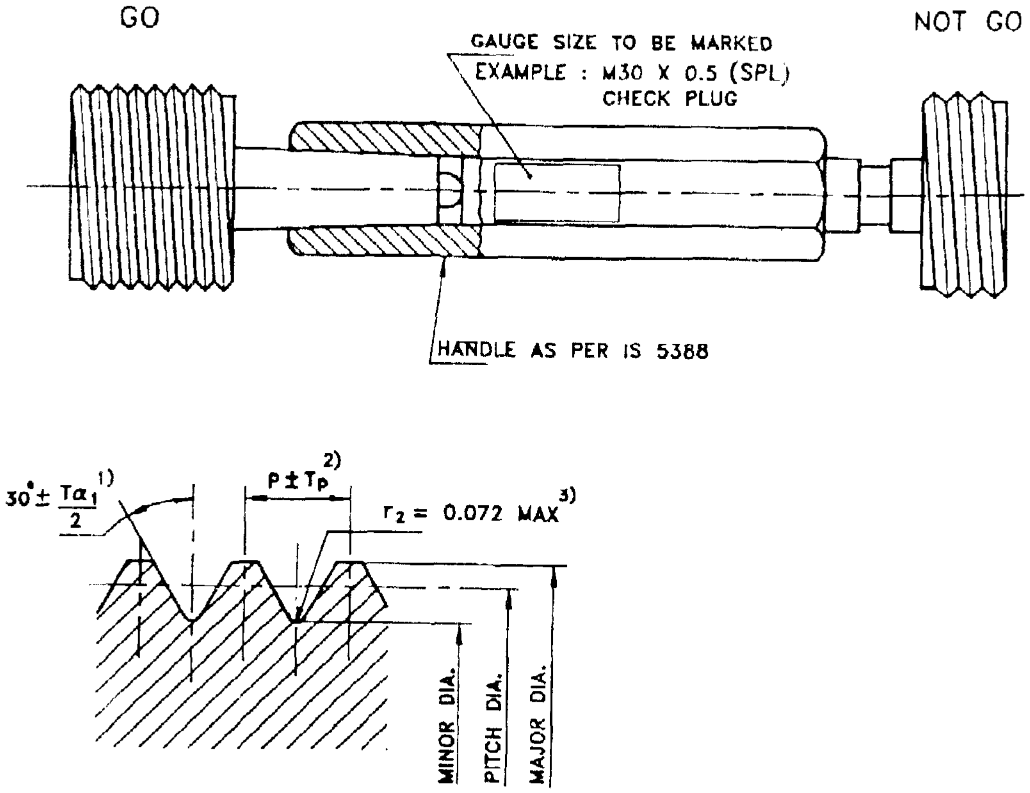
12.3 The dimensions for major, minor and pitch diameters of wear check plugs for 'GO' screw ring gauges are given in Table 7 to be read with Fig. 7.

13 WEAR CHECK PLUG GAUGE FOR SOLID 'NOT GO' SCREW RING GAUGE

13.0 This wear check plug gauge is used to ascertain that the pitch diameter of the 'NOT GO' screw ring gauges has not exceeded the wear limits.

13.1 The wear check plug screwed by hand, without using excessive force, may enter into both ends of the 'NOT GO' screw ring gauge, but not more than one turn of thread. If it can be screwed in more than one turn of thread, the 'NOT GO' screw ring gauge no longer meets the specification and should be scrapped.

13.2 The dimensions for major, minor and pitch diameters of wear check plugs for 'NOT GO' screw ring gauges are given in Table 8 to be read with Fig. 8.



THREAD PROFILE OF 'GO' AND 'NOT GO' GAUGE

[1] Tol for flank angle $\frac{T\alpha 1}{2}$ = 25 minutes.

[2] Pitch tolerance Tp = 0.005 mm.

[3] Alternatively a suitable clearance groove may be provided.

All dimensions in millimetres.

FIG. 6 SCREW CHECK PLUG GAUGE FOR NEW 'NOT GO' SCREW RING GAUGE

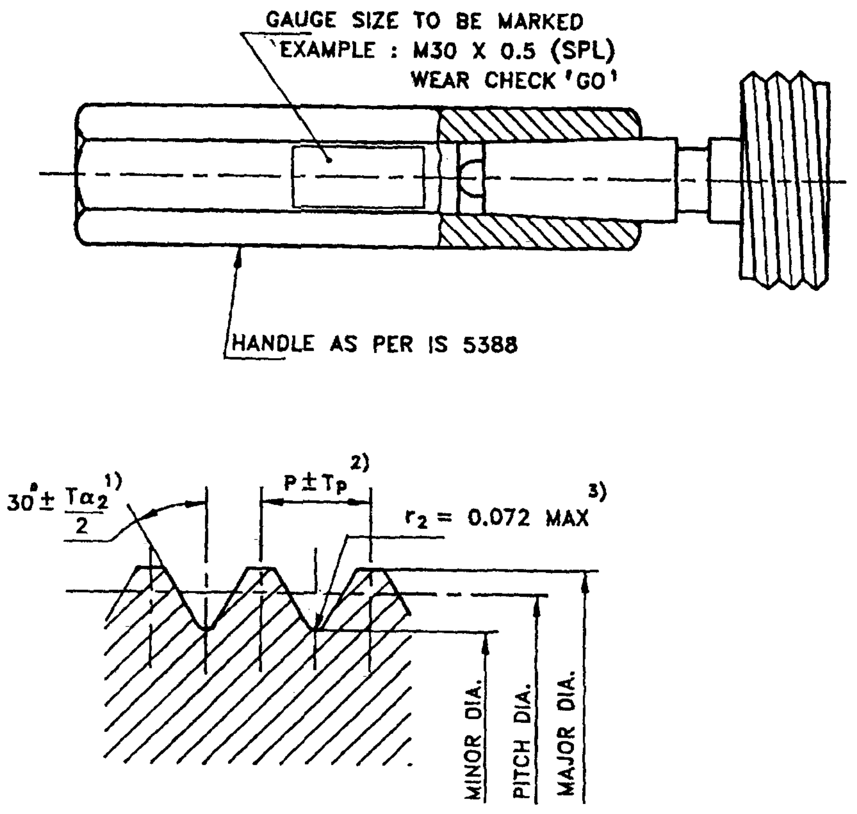
Table 6 Dimensions for Minor, Major and Pitch Diameters for Screw Check Plugs for New 'NOT GO' Screw Ring Gauges

(*Clause* 11.4)

All dimensions in millimetres.

Nominal Size and Pitch	Gauge Type	Major Dia Size Tol = ± 0.007	Minor Dia *Max*	Pitch Dia Size Tol 'T_{CP}' = ± 0.0035
M20×0.5	GO	20.000	19.331	19.653
	NOT GO	19.940	19.348	19.670
M21×0.5	GO	21.000	20.331	20.653
	NOT GO	20.940	20.348	20.670
M22×0.5	GO	22.000	21.331	21.653
	NOT GO	21.940	21.348	21.670
M23×0.5	GO	23.000	22.331	22.653
	NOT GO	22.940	22.348	22.670
(M27.5×0.5)[1]	GO	27.500	26.831	27.153
	NOT GO	27.440	26.848	27.170
M28×0.5	GO	28.000	27.331	27.653
	NOT GO	27.940	27.348	27.670
M29×0.5	GO	29.000	28.331	28.653
	NOT GO	28.940	28.348	28.670
M30×0.5	GO	30.000	29.331	29.653
	NOT GO	29.940	29.348	29.670

[1] Non preferred size. Not to be used for new designs.



THREAD PROFILE

[1] Tol for flank angle $\frac{T\alpha 2}{2}$ = 25 minutes.

[2] Pitch tolerance Tp = 0.005 mm.

[3] Alternatively a suitable clearance groove may be provided.

All dimensions in millimetres.

FIG. 7 WEAR CHECK PLUG GAUGE FOR 'GO' SCREW RING GAUGE

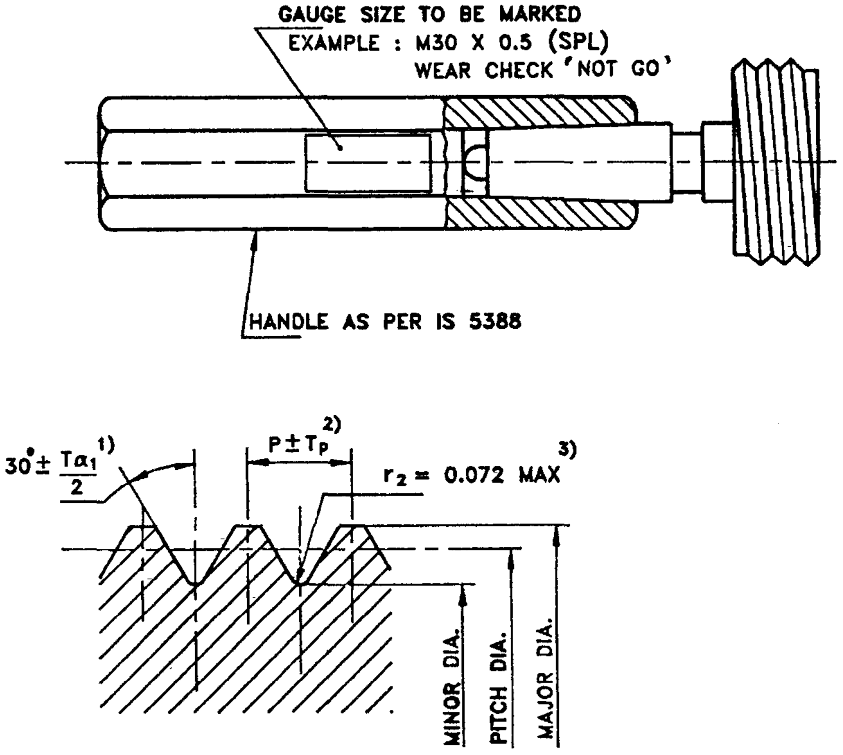
Table 7 Dimensions for Major, Minor and Pitch Diameters of Wear Check Plugs for 'GO' Screw Ring Gauges

(*Clause* 12.3)

All dimensions in millimetres.

Nominal Size and Pitch	**Major Dia Size** Tol = ± 0.0035	**Minor Dia** *Max*	**Pitch Dia Size** Tol 'T_{CP}' = ± 0.0035
M20×0.5	19.840	19.403	19.740
M21×0.5	20.840	20.403	20.740
M22×0.5	21.840	21.403	21.740
M23×0.5	22.840	22.403	22.740
(M27.5×0.5)[1]	27.340	26.903	27.240
M28×0.5	27.840	27.403	27.740
M29×0.5	28.840	28.403	28.740
M30×0.5	29.840	29.403	29.740

[1] Non preferred size. Not to be used for new designs.



THREAD PROFILE

[1] Tol for flank angle $\frac{T\alpha 1}{2}$ = 25 minutes.

[2] Pitch tolerance Tp = 0.005 mm.

[3] Alternatively a suitable clearance groove may be provided.

All dimensions in millimetres.

FIG. 8 WEAR CHECK PLUG GAGUE FOR 'NOT GO' SCREW RING GAUGE

Table 8 Dimensions for Major, Minor and Pitch Diameters of Wear Check Plugs for 'NOT GO' Screw Ring Gauges

(*Clause* 13.2)

All dimensions in millimetres.

Nominal Size and Pitch	Major Dia Size Tol = ± 0.007	Minor Dia *Max*	Pitch Dia Size Tol 'T_{CP}' = ± 0.0035
M20×0.5	19.924	19.348	19.674
M21×0.5	20.924	20.348	20.674
M22×0.5	21.924	21.348	21.674
M23×0.5	22.924	22.348	22.674
(M27.5×0.5)[1]	27.424	26.848	27.174
M28×0.5	27.924	27.348	27.674
M29×0.5	28.924	28.348	28.674
M30×0.5	29.924	29.348	29.674

[1] Non preferred size. Not to be used for new designs.

Bureau of Indian Standards

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